

DESIGN AND IMPLEMENTATION OF USER SPECIFIABLE DOMESTIC ENERGY SAVER USING GSM

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Abstract:- Electricity is one of the vital requirement for sustainment of comforts of life. In our country we have lot of localities where there is surplus electricity supply while many areas do not even access to it by which uneven load sharing occurs. This is because we are not aware of the power consumed by us due to which power quality also gets affected. Our policies of its distribution are also partially responsible for this because we are still not able to correctly estimate our exact requirements and still power theft is prevailing. The home appliances which consume more power causes increase in the payment of excessive bills. The remedy for all this problem is Domestic Energy Saver Using GSM. It will keep track on meter reading and sends SMS to the consumer when they consume more power than the specified power. The user can automatically shed the load by sending SMS through the GSM modem which will turn on the appropriate relay.

INTRODUCTION

The demand for power is increasing day by day but those demands are not fully satisfied due to lack of sources. Other reason may be like not utilizing the power subsequently to the need alone. Many people waste it unknowingly or may be knowingly. And also the bill varies every month (i.e) sometimes it may be less or it may be very high than expected. So the main objective of this project is to make the people aware of the power utilized by them and also to control it when it is utilized beyond their needs. By this the user can maintain a constant bill all the months. If the user faces a situation of using more loads, then he can change the units specified in the microcontroller. A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. A special type of GSM is used here. Real-time clock (RTC) used counts seconds, minutes,

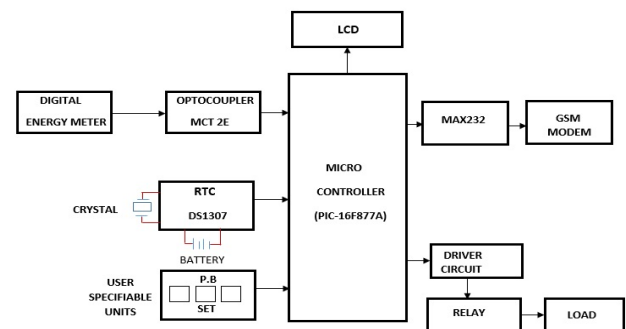
hours, date of the month, month day of the week and year with leap-year compensation valid up to 2100.

The main objective of our project is

- To enhance power quality.
- To be alert on power theft.
- To create conscious about the power used.
- To maintain constant electric bill

OVERALL BLOCK DIAGRAM

The block diagram consists of the power supply section, the microcontroller, the GSM modem, LCD display, Energy Meter. The GSM modem is controlled by the microcontroller that sends signals to the GSM to receive and transmit messages. The messages are the recorded data of the number of units of the energy meter that are stored in the microcontroller. The pulses are counted by a program in the microcontroller with the help of an pulse sensing circuit. The control messages to the GSM are sent from a mobile number already allocated for the task.



OVERALL OPERATION OF PROPOSED SYSTEM:

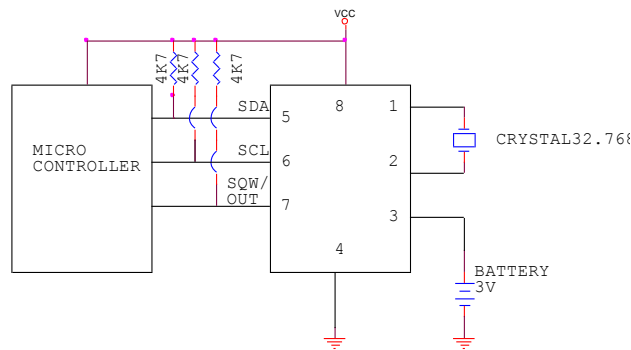
The working is that the user specifies the amount of power consumed according to their needs. If the user consumes more power than the specified power then the microcontroller sends SMS to the consumer, so that the user can control the power by themselves. A microcontroller input is effectively interfaced to a digital energy meter that takes the reading from the energy meter and displays the same on an LCD. The desired number is auto saved on the microcontroller over a missed call. The proposed paper has PIC16F877A flash microcontroller which is used to control the power utilized by the user. It is interfaced with the energy meter through optocoupler by which pulses are sent as input to it. It is also interfaced with the GSM modem through MAX232 receiver. The power supply consists of a step down transformer 230/12V, which steps down the voltage to 12V AC. This is converted to DC using a Bridge rectifier and it is then regulated to +5V using a voltage regulator which is required for the operation of the microcontroller and other components. To control the power used, the user specifies the units consumed according to their needs in the microcontroller. If the user consumes more units than the specified units then the microcontroller sends SMS to the consumer. The user can control the power by sending back message through which the relay is operated and load is shed down. The user can also change the units according to his situation. By this proposed system power theft can also be detected as we know the amount of units utilized by us.

PROPOSED PROTOTYPE:**PULSE SENSING CIRCUIT**

Digital meter output is fed to this circuit. The purpose of this unit is to sense the number of revolutions of the disc rotation. For each rotation, the sensing unit has to produce a pulse. This signal is given to the MCT2E. This block consists of IC MCT2E based opto coupler to provide isolation between control circuits and power circuits. An opto coupler allows signal transfer without coupling wires or capacitor. It transducers input voltage to proportional light intensity by using LEDs. This output is fed to the microcontroller.

REAL TIME CLOCK

RTC IC-DS 1307 is used in our project. Real time clock is used to generate real time signal. It is the special type of IC in which battery is in build. Even through power is off it continuously maintains the timing signal. This IC is generally called RTC. In our project the RTC is used to provide the timing signal to micro controller.



MICROCONTROLLER

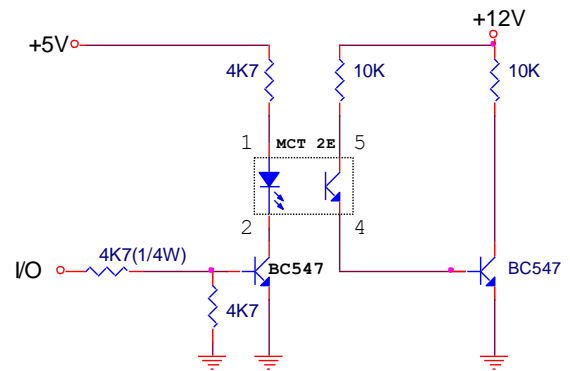
Here we are using PIC 16F877A micro controller. The PIC 16F877A is a low-power, high-performance 8-bit microcomputer with 4K bytes of Flash Programmable and Erasable Read Only Memory (PEROM).

LIQUID CRYSTAL DISPLAY

LCD display is interfaced with the PIC micro controller to display the messages. LCDs have become very popular over recent years for information display in many 'smart' appliances. They are usually controlled by microcontrollers. They make complicated equipment easier to operate. LCDs come in many shapes and sizes but the most common is the 16 character x 2 line display with no back light. It requires only 11 connections – eight bits for data (which only used two here). It runs off a 5V Dc supply and only needs about 1mA of current. The display contrast can be varied by changing the voltage into pin 3 of the display, usually with a trim pot.

OPTOCOUPLER

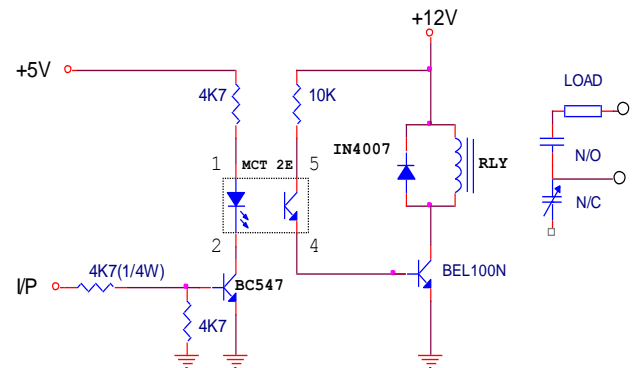
This block consist IC MCT2E based opto coupler to provide isolation between control circuits and power circuits. An opto coupler allows signal transfer without coupling wires or capacitor. It transducers input voltage to proportional light intensity by using LEDs.



RELAY DRIVER CIRCUIT

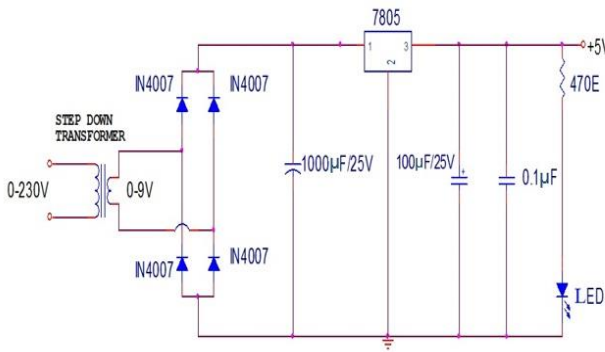
In this relay section contains relays and drivers. The PIC microcontroller gives logic high output has to drive the load.

OPTOCOUPLER WITH RELAY DRIVER



5V POWER SUPPLY

A power supply circuit is very essential in any project. This power supply circuit is designed to get regulated output DC voltage. The 9 volt transformer, step down the main voltage (230v) into 9 volts. The secondary voltage of transformer is rectified using bridge rectifier. The rectified unidirectional DC is smoothed by 1000mf filter capacitor. The smooth DC is then fed to the three terminal +ve regulator called 7805 to get 5v DC supply. The power supply section is for supplying voltages to the entire circuit unit.



12V POWER SUPPLY

A power supply circuit is very essential in any project. This power supply circuit is designed to get regulated output DC voltage. The 0-15 volt transformer, step down the main voltage (230v) into 15 volts. The secondary voltage of transformer is rectified using bridge rectifier. The rectified unidirectional DC is smoothed by 1000mf filter capacitor. The smooth DC is then fed to the three terminal +ve regulator called 7812 to get 12v DC supply. The power supply section is for supplying voltages to the relay.

GSM

The Board Level product can be integrated in to Various Serial devices in providing them SMS and Data capability and the unit housed in a Metal Enclosure can be kept outside to provide serial port connection. The GSM Modem supports popular "AT" command set so that users can develop applications quickly. The product has SIM Card holder to which activated SIM card is inserted for normal use. The power to this unit can be given power supply.

MAX 232

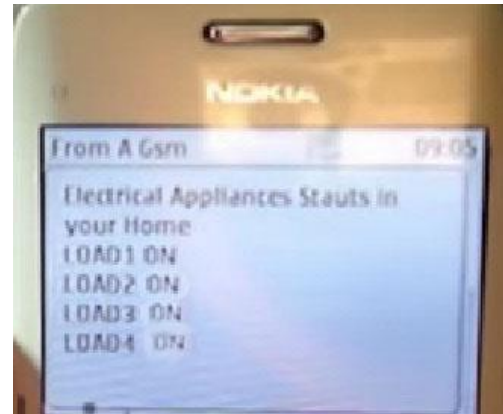
The MAX232 is an integrated circuit that converts signals from an RS-232 serial port to signals suitable for use in TTL compatible digital logic circuits. The MAX232 is a dual driver/receiver and typically converts the RX, TX, CTS and RTS signals. When a MAX232 IC receives a TTL level to convert, it changes a TTL Logic 0 to between +3 and +15V, and changes TTL Logic 1 to between -3 to -15V, and vice versa for converting from RS232 to TTL.

PUSH BUTTON SET

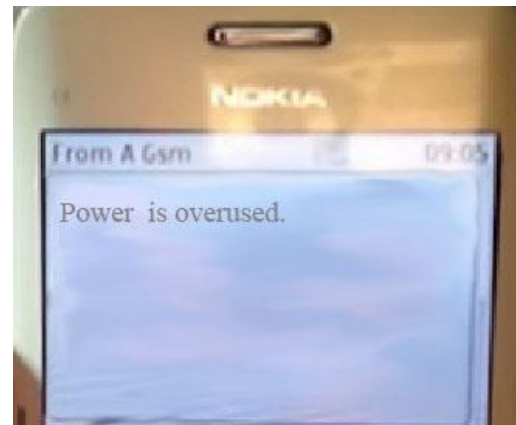
This section consists of reset buttons that are connected to the pins of the microcontroller. The user can change the units specified limit according to his needs.

RESULTS AND DISCUSSIONS:

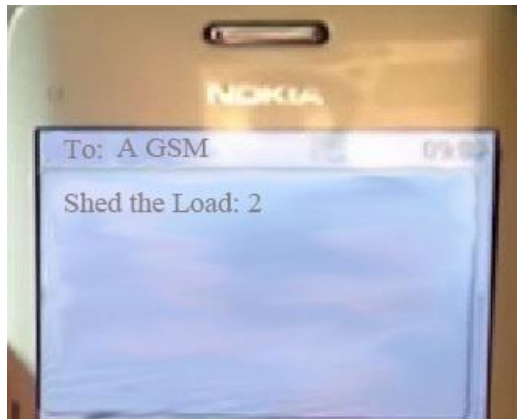
The status of the loads will be shown as below:



When the loads exceed the specified units, the GSM sends message to the customer.



Now the customer sends SMS to the GSM to shut down the load that has low priority.



CONCLUSION

In the conventional methods people don't know about the amount of power being used by them. So there are many chances of occurrence for power theft. They don't utilize the power subsequently to the need alone. Many people waste power as they are not aware of the power utilized by them. This will also lead to variation in the bill (i.e) sometimes it may be less or it may be very high than expected. No constant bill can be maintained. If some people use more than the power provided to them it causes low voltage nearby. This also affects the power quality of the system. In industries excessive use of inductive loads leads to decrease in power factor. Thus using this project all these disadvantages can be overcome, resulting in the following advantages: Improved power quality. No power wastage. Low Voltage can be prevented. Less power consumption. Power theft can be easily identified. As the power quality is maintained by everyone the overall system gets improved. Power factor is improved.

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